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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/540,069

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EXAMINER

CORBETT, JOHN M

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/540,069	Applicant(s) ROBERT-COUTANT ET AL.	
	Examiner JOHN M. CORBETT	Art Unit 2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 June 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,5 and 6 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-3,5 and 6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1, 3 and 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Boyd (US 4,138,721) in view of Bushberg et al. ("The Essential Physics of Medical Imaging", 2002, ISBN 0-683-30118-7) and Udupa ("Three-dimensional Visualization and Analysis Methodologies: A Current Perspective", 1999, Radiographics, Volume 19, Pages 783-806).

With respect to claim 1, Boyd discloses a method for reconstructing a radiographic image of a large sized object by bits, the bits being crossed by a diverging radiation produced by a source, the radiation undergoing an attenuation, the attenuation being measured by a mono-dimensional or two-dimensional network of detectors on which the radiation projects, each measurement giving a projection vignette, the source as well as the network of detectors being displaced along the object at each measurement so that projection vignettes overlap, the method comprising a combination of the overlapping vignettes for reconstructing the image (Figures 6 and 16), as well as the following steps:

discretising the object into elements defining reconstruction heights (Col. 7, lines 41-44 and Figures 6 and 12);

Art Unit: 2882

associating the voxels with at least one detector respective of the network on which the radiation projects after having crossed the element (Col. 7, line 5 – Col. 8, line 4 and Figures 6 and 12-15);

allocating an attenuation value to each element according to the values measured by the associated detector (Col. 7, line 5 – Col. 8, line 4 and Figures 6 and 12-15).

Boyd fails to explicitly disclose voxels.

Boyd further fails to disclose combining the attenuation values of the voxels along parallel columns at the different reconstruction heights to obtain a two dimensional image.

Bushberg et al. teaches voxels (Figure 13-2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Boyd to include the voxel representation of Bushberg et al., since a person would have been motivated to make such a modification to improve imaging by providing the 2D CT image which corresponds to a 3D section of the patient with a third dimension which corresponds to the slice-thickness of the reconstructed image (Page 329, lines 6-14 and Figure 13-2) as implied by Bushberg et al.

Udupa teaches combining the attenuation values of the voxels along parallel columns at the different reconstruction heights to obtain a two dimensional image (Page 798, Col. 2, line 5 - Page 799, Col. 1, line 12 and Figure 20. Volume (voxel) projection, where voxels are directly projected, or ray casting, where line traced perpendicular to the viewing plane. For patient laying on table, such as in Figures 1-4, 6 12, and 16 of Boyd, the projection image generated with either volume projection or ray casting techniques necessarily combines the attenuation values of the

Art Unit: 2882

voxels along parallel columns at the different reconstruction heights to obtain a two dimensional image, i.e. a projection image.).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Boyd as modified above the combining of Udupa, since a person would have been motivated to make such a modification to improve an imaging procedure by allowing the three-dimensional seen be viewed on a two dimensional monitor as is always needed (Page 798, Col. 2, lines 8-11) as taught by Udupa.

With respect to claims 3 and 6, Boyd further discloses the attenuation value attributed to each voxel is obtained by iterative projection of attenuation values measured by the detectors, provisional values being allocated to the voxels and corrected after having been projected on the detectors, in calculating the differences between the sums of provisional values on the projection lines and the values measured by the detectors on the projection lines, and by projecting the differences on the projection lines to correct the provisional values, wherein the attenuation values of the voxels are digitally combined on the groups of voxels superimposed at the different reconstruction heights (Col. 8, line 46 – Col 10, line 38 and Figure 15).

With respect to claim 5, Boyd as modified above necessarily further discloses the method is applied to osteodensitometry (Boyd further discloses in Figures 1-3, patient imaged to include bones and Udupa further teaches thresholding (Page 791, Col. 2, lines 16-38, Page 793, Col. 1, lines 9-19), maximum intensity projections (Page 799, Col. 1, lines 13-20) and voxel projections of bones (Figure 21).

Art Unit: 2882

2. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Boyd in view of Bushberg et al. and Udupa as applied to claim 1 above, and further in view of Ribeiro et al. (“Tridimensional image reconstruction method based on the modified algebraic reconstruction technique and B-spline interpolation”, 1997, IEEE, Proceedings of the Symposium on Computer Graphics and Image Processing 1997, Pages 111-118).

With respect to claim 2, Boyd as modified above suggests the method as recited above.

Boyd further discloses an attenuation value attributed to each voxel (Col. 9, lines 7-9).

Udupa further teaches the attenuation values of the voxels are combined by a digital combination on the groups of voxels superimposed at the different reconstruction heights (Page 798, Col. 2, line 5 - Page 799, Col. 1, line 12 and Figure 20, digital image constructed).

Boyd fails to explicitly disclose the attenuation value attributed to each voxel is equal to the sum of the values measured by the associated detector, divided by the number of vignettes that contribute to giving the associated detector.

Ribeiro et al. teaches the attenuation value attributed to each voxel is equal to the sum of the values measured by the associated detector, divided by the number of vignettes that contribute to giving the associated detector (Page 114, Col. 1, lines 1-6).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Boyd as modified above the attributing of Ribeiro et al., since a person would have been motivated to make such a modification to improve imaging by reducing reconstruction times by selecting initial estimates for the voxels that more closely

Art Unit: 2882

approximate expected final iteratively reconstructed voxel values (Page 114, Col. 1, lines 1-42) as implied by Ribeiro et al.

Response to Arguments

3. Applicant's arguments filed 6 June 2009 have been fully considered but they are not persuasive.

With respect to claim 1, the Applicant argues that Udupa fails to teach combining the attenuation values of the voxels along parallel columns at the different reconstruction heights to obtain a two dimensional image. In particular the Applicant argues that Udupa excludes voxel values when rendering the two-dimensional image. The Examiner disagrees. Udupa explicitly states “ray casting (34), which consists of tracing a line perpendicular to the viewing plane from *every pixel* in the viewing plane into the scene domain” or “voxel projection (72), which consists of directly *projecting voxels encountered along the projection line* from the scene onto the viewing plane” (Page 799, Col. 1, lines 1-8). Voxel values in these projection methods are not excluded unless additional constraints are placed upon the projection methods. The Applicant attempts to argue that additional constraints *must* be applied to the voxels prior to applying the voxel projection or ray casting projection methods and explicitly discusses two types of rendering techniques which apply different types constraints on which voxels are projected, i.e. MIP and surface rendering. Again, Udupa explicitly states “either of these projection methods *may be used* with any of the three rendering techniques (MIP, surface rendering, volume rendering)” (Page 799, Col. 1, lines 10-12). Udupa does not require that either of the two

Art Unit: 2882

projection methods be combined with any of the three cited rendering methods. In summary, Udupa does teach combining the attenuation values of the voxels along parallel columns at the different reconstruction heights to obtain a two dimensional image. Therefore, the Applicant's arguments are not persuasive and the claim remains rejected.

The Examiner notes that the Applicant's arguments with respect to claims 2-3 and 5-6 are presented as being based upon the arguments with respect to claim 1 and therefore are maintained for the reasons as set forth in claim 1 above.

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Art Unit: 2882

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN M. CORBETT whose telephone number is (571)272-8284. The examiner can normally be reached on M-F 8 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. M. C./
Examiner, Art Unit 2882

/Edward J Glick/
Supervisory Patent Examiner, Art Unit 2882